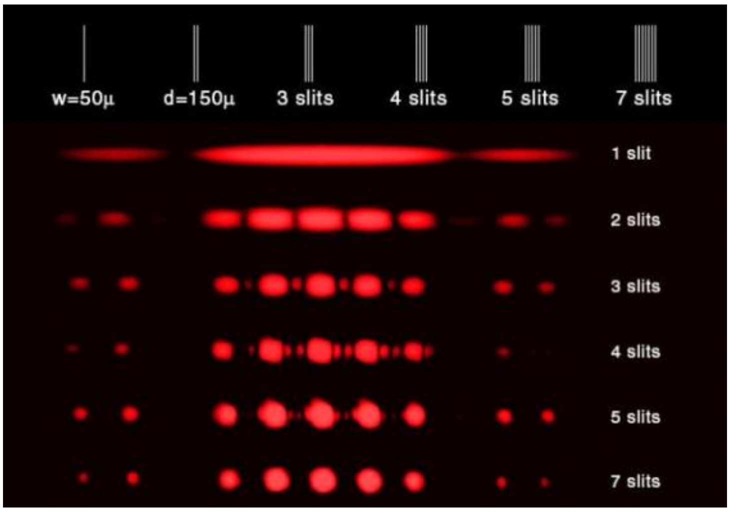
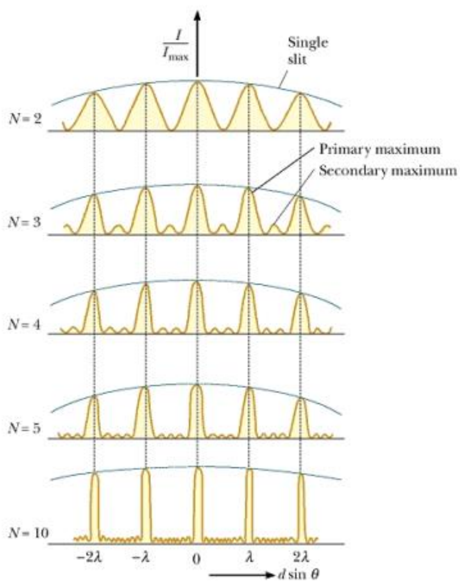
Tuesday, May 30, 2017 12:35 PM

Multi slits:
the more slits, the narrower the dots





the equation $\sin\theta = n\lambda/d = x/L$ (IB notation)

$s = \lambda D/d$

s is x the distance between successive bright bands (n=1)

d is the distance between slits/sources

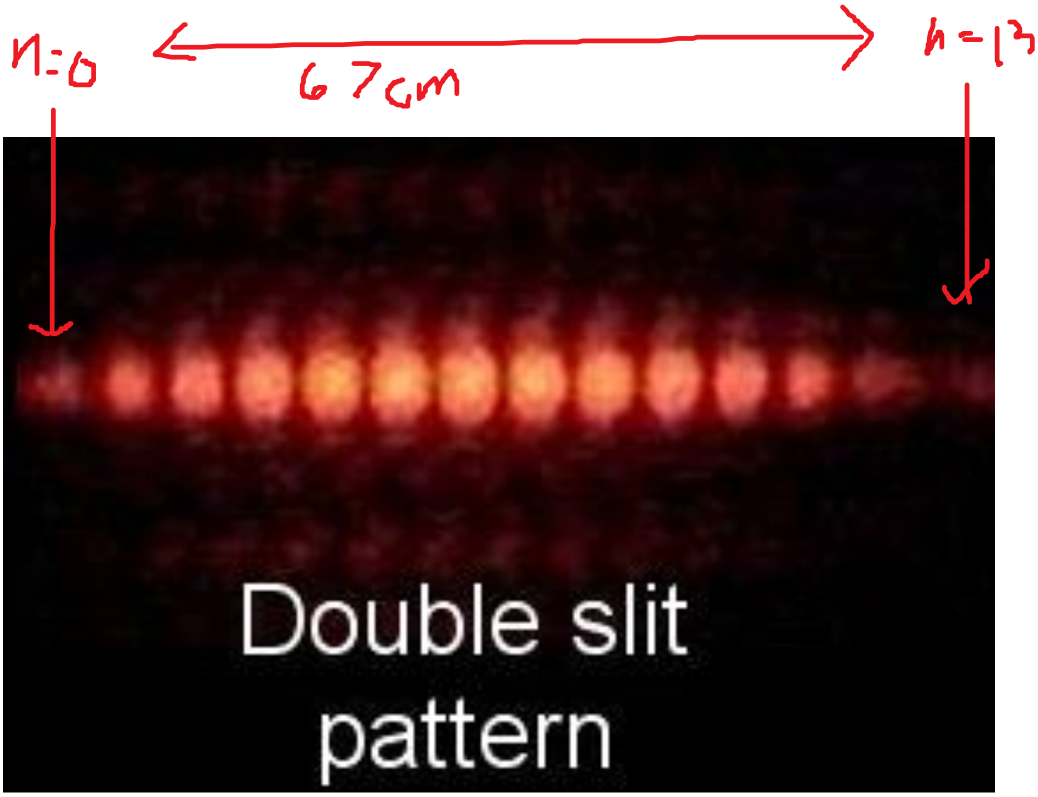
λ is wavelength

D is L the distance between the slits and the screen.

valid for small angles, sinθ=tanθ

for very small angles, sinθ = θ in radians

Double slit observations



We shined a helium/neon laser, wavelength 632.8nm, through two slits and observed the above pattern on the screen at the back of the class, 6.48m away from the slits.

a) What is the distance between the slits if the

distance from the centre of the zeroith bright band and the 13th bright band is 67cm.

b) If I used violet? light with exactly half the wavelength of the red light, how would the pattern change?

lasers - 1. high intensity

2. monochromatic - one wavelength
3. coherent - the photons are in phase - peaks on peaks - photon - wave bundle of light E=hf
4. beam doesn't spread much -

$$s = \frac{\lambda D}{d} \qquad d = \frac{\lambda D}{s}$$

$\lambda = 632.8\,nm = 6.328 \times 10^{-7}\,m$

$D = 6.48\,m$

$S = \frac{67\,cm}{13} = \frac{0.67\,m}{13}$

$$d = \frac{6.328 \times 10^{-7} \cdot 6.48}{0.67 \div 13}$$

$= 7.96 \times 10^{-5}\,m$

$= 0.08\,mm$

b) if the wavelength is half, the distance between the bright bands will be half. s=λD/d

p395Q1-4, p402 CR, 2.1-2.4

p404 Q2, 5 first
Imaging:
attenuation

When you send a signal down a fibre optic cable, or any cable, energy is lost. We quantify the loss using a log scale, called attenuation, measured in dB or dB/km.

$$\text{attenuation} = 10\log(I/I_o)$$

I is intensity, in watts or watts/m^2 after the change
I_o is the intensity before the change

$y = \log x$ means $10^y = x$

eg. A signal of power 12mW is input into a cable of specific attenuation 4.0dB km^{-1}. Calculate the power of the signal after it has travelled 6.0km in the cable.

loss

attenuation = -4.0dB/km x 6.0km

$= -24\text{dB} = 10\log(I/I_o) = 10\log(I/12\text{mW})$
$= -24\text{dB}/10 = \log(I/12\text{mW})$
$10^{-24/10} = I/12\text{mW}$
$I = 12\text{mW}\ 10^{(-24/10)}$
$I = 12\text{mW} \times 0.00398 = 0.048\text{mW}$

$I = 12mW\ 10^{(-24/10)}$

$I = 12mW \times 0.00398 = 0.048mW$

lab next class - Wednesday is relativity

pre-read lab